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Disaster Mitigation Working in Massachusetts

New Culvert Works: No Flooding at East Street

"East Street remained open to traffic throughout the flood. For a while, it was the only direct route into and out of town."
- Brian Gilbert, Superintendent of Public Works, Tewksbury, MA

Photo courtesy of Coughlin Environmental Services

Upstream side of new culverts at East Street during stormwater runoff in March 2010

Flooding and the closure of East Street, just east of the town center in Tewksbury, Massachusetts, has been an annual – and in some years an even more frequent – event.

Yet, when heavy rains in March 2010 brought record-breaking flows to streams across eastern Massachusetts, the floodwaters of Strongwater Brook topped out below the East Street roadway, thanks to recent improvements in the drainage system there.

"The backup of floodwaters at the East Street-Strongwater Brook crossing has long been a problem," said Brian Gilbert, Superintendent of Public Works in Tewksbury. "So it was good to finally get that resolved last summer (2009)."

Over the past several decades, flooding along the Shawsheen River and its tributary, Strongwater Brook, has overtopped stream crossings on major through streets in Tewksbury. Parts of the town were temporarily isolated, requiring the detour of traffic to alternate routes that quickly became congested, which also severely limited access for emergency response vehicles.

In an effort to mitigate the extent and duration of the disruptions caused by flooding of at least one of these streets, town officials proposed to install new, larger culverts at the East Street-Strongwater Brook crossing.

Prior to the reconstruction of the crossing, the brook passed through two old granite culverts, each with an opening of approximately 3 feet by 4 feet. During periods of high flow, the old culverts could not carry all the water, which then backed up and eventually overtopped the roadway.

The two new concrete box culverts, each 5 feet high by 10 feet wide, together provide an opening four times larger than the old culverts. As extra insurance against future flooding across East Street, the existing roadway was raised by three feet, so that it is now higher than the elevation of the 1-percent-annual-chance flood (known as the 100-year flood) at the crossing.

Because this reach of Strongwater Brook lies within a wetland, proposed drainage improvements had to consider wetlands issues. These include the maintenance of natural water levels and velocities, their fluctuations during periods of low flow, and the accommodation of high flood flows.

This dual requirement was resolved by incorporating two features into the design and installation of the new culverts. First, the bottoms of the culverts were set at one foot below the natural channel of the brook and then backfilled to establish a natural channel within the culverts. Secondly, the culverts were sized so that during a flood, water would back up and be temporarily stored in the large wetland area on the upstream side of the roadway. Under such conditions, the water would rise above the tops of the culverts, but not high enough to overtop East Street.

"Completion of the culvert upgrade on East Street last summer made it a lot easier on us during this spring's (2010) floods," said Gilbert. "While Main and Shawsheen Streets were flooded and temporarily closed, East Street remained open to traffic throughout the flood. For a while, it was the only direct route into and out of town."

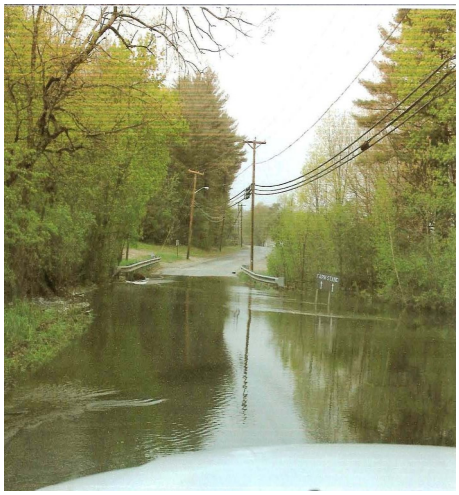

Photo courtesy of Coughlin Environmental Services

Views to west along East Street at the Strongwater Brook Crossing under non-flood and flood conditions before culvert upgrade

Drainage improvements at East Street and Strongwater Brook were made possible by a grant from the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP). The HMGP provides 75 percent of the total cost of implementing long-term hazard mitigation measures following major disaster declarations.

For the East Street culvert upgrade project, HMGP provided $281,250 of the total cost of $375,000. The $93,750 remainder of the project cost was the responsibility of the Town of Tewksbury.

Evidence of a former railroad crossing that coincides with the present-day East Street crossing of Strongwater Brook can still be seen at the site, lending a sense of history to the project. A small part of the granite block abutment for the rail crossing is exposed on the downstream side of East Street, and pieces of granite from the old culverts and the abutment have been placed for erosion protection on the embankments on both sides of the street adjacent to the new culverts.

FEMA

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